Todhunter gives no account of this work: it is apparently a translation of the work described in § 984.

The following work by Delambre and Legendre (will this throw light on § 1,146?) does not seem to be described: it is "Methodes analytiques pour la détermination d'un arc du méridien précédées d'un memoire sur le même sujet," par A. M. Legendre. Paris, 1799. 4to.) In note ii. to "Methode pour determiner la longueur exacte du quart du meridien," par A. M. L. occurs *Legendre's Theorem.* There are 176 pp., 16 pp. of tables at the end, 5 pp. of "Observations sur quelques endroits du mêmoire du cit. Delambre," par A. M. Legendre; 2 plates, 7 pp. of *avertissement*, and 4 pp. of contents.

We now close our notes with a few remarks on §§ 531, 682, and 1,584. The memoir, which neither Playfair nor Mr. Todhunter have been able to procure a sight of, is to be met with in vol. i. of the Giuliani memoirs cited above, consequently its date is antecedent to 1743. It occupies pp. 65-88, and is entitled "Problema mecanicum de solido maximæ attractionis solutum, a P. Rogerio Josepho Boscovich." The problem is, "Data quantitate materiæ punctum attrahentis, in quacunque lege distantiarum invenire solidum ipsum continens, quod maximè omnium attrahat ipsum punctum positum in axe solidi producto ad datam distantiam ob ipsius solido vertice propiore." The author gives a geometrical and an analytical solution of the problem, and concludes, "Solutio geometrica in eo huic posteriori præstat quod ibi determinatur solidum maximæ attractionis etiam inter solida omnia irregularia, hic tantum inter solida genita rotatione curvæ circa axem."

The greater part of this second volume is taken up with the important writings of Laplace, Poisson, Gauss, Ivory, and Plana.

In the case of Laplace, who was, like some other writers, not in the habit of acknowledging his indebtedness to preceding authors, the result of the investigations is to restore his reputation to its proper eminence. "In the present history, and in that of Probability, I have gone over a third part of the collected mathematical works of Laplace; and to that extent the evidence of his great powers and achievements is, I hope, fully and fairly manifested."

Our work is now nearly done; were we to make use of all our notes, we might easily double and treble what we have written.* We have noted upwards of fifty articles which are interesting as sidelights: thus, § 227, Bouguer's remarks on what we now call the "personal equation;" § 710, transformation of variables in a triple integral, and many others. The value of the index would have been enhanced had reference been made to these; as it is, the index is much fuller than in the earlier volumes, and we have detected but few errors. This is no new feature, for all Mr. Todhunter's books are most carefully got up in this respect, and we have not met with a single important error in the mathematical work; the few mistakes we have come across are easily corrected.

There are indications here and there throughout the volumes that, should the writer be able to secure the requisite leisure, he will not want for subjects to exercise his special gifts upon. We sincerely hope that he will do so at an early date, and that it may be our lot to read the results. In the course of the preparation of the present work Mr. Todhunter has published, in the Royal and other Societies' proceedings, various papers which have grown out of his investigations in the history of our two subjects.* R. TUCKER

* In our remarks we have preferred to treat the subjects from an historical rather than from a mathematical point of view.

* Possibly some further memoirs of use might be found in the "Librorum in Bibliothecâ Speculæ Pulcovensis, anno 1858, exeunte contentorum catalogus systematicus," by Otto Struve. Petropoli, 1860.

TRAINING

Training in Theory and Practice. By Archibald Maclaren. Second Edition. (Macmillan & Co., 1874.)

WHEREVER we go, "The Boat Race" is the topic of the hour. Opinions are freely expressed as to the relative merits of the rival crews; and the risks and dangers incurred during the process of training, sturdily insisted on by some, are as obstinately denied by others. The respective values of the slow and quick stroke—the American fashion of "sliding-seats," and a variety of kindred questions, are eagerly debated, occasionally by men who really understand what they are talking about, but more frequently in order to make conversation, or, as the phrase goes, "for the sake of something to say."

In such a state of the public mind, it has by a happy chance been so ordered that the second edition of Mr. Maclaren's well-known work on Training should appear, at a moment when all will take unusual interest in its contents.

From a perusal of this treatise everyone may gather information calculated to be of service to him, not only for the time being but for the future. The man who likes to know a little of everthing, may with advantage indulge his curiosity about a subject which has perhaps hitherto been out of his line; while the father with a son in "the eight," and whose mind has been disturbed by letters in the papers, hinting at dire mischief as the outcome of training, may find substantial comfort in its pages. All those who, either from necessity or for amusement, undergo much physical exertion, will do well to imbue themselves with the author's teaching; and the "man of ease" or of sedentary occupation will find hints for health or sanitary lessons of a description which, if honestly carried out, would cause the ruin of half the doctors in London.

Mr. Maclaren uses "rowing" as the peg on which to hang his theme, and the reason he gives for so doing is as follows:—

"It is the exercise most susceptible of being influenced by a judicious system of bodily preparation, being at once an act of considerable intricacy, demanding long and assiduous practice, and an exercise of considerable difficulty, involving the possession, although not in an equal degree, of both muscular and respiratory power, to promote which is the object of all training."

The question, what is training? and what is it meant to do? he answers thus:—"It is, to put the body with extreme and exceptional care under the influence of all the agents which promote its health and strength, in order to enable it to meet the extreme and exceptional demands upon its energies." There can be no doubt that the essence of this paragraph is contained in the words "extreme and exceptional care;"—for without such care,

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instances are furnished to alarmists of men "fainting by the way," and a highly valuable art is in danger of being brought into disrepute. We have no fear for the men engaged in a great race like that which takes place on Saturday—they have been carefully instructed in the proper method of training—all that experience has taught has been lavished on them, and the result is, as Dr. Morgan's statistics show, that they live as long as other portions of the civil community.

But on the other hand we do fear for the many persons who assert that they are in training for some race or other physical feat, but from whom on inquiry we learn that their notions and practice are so desultory, and so deficient in anything like scientific detail, that it is an abuse of the word training to apply it to their misdirected proceedings. They forget, or at least do not sufficiently consider, that the feat they are about to attempt will require of them, at some critical moment, a supreme effort; and that in the making of this effort, a lasting injury may be inflicted upon a frame that is only imperfectly prepared.

To them we say, "if a thing is worth doing at all it is worth doing well." Train thoroughly or not at all—you have no right to jeopardise your future by "extreme carelessness" when all bad results may be avoided by "extreme care."

In former times Diet was looked upon as of paramount importance among the agents of health in training; Mr. Maclaren, however, places exercises in the front rank, and justifies himself for doing so in the following logical and telling words:—"So long as men believe that the qualities which they covet are to be obtained from mere dietary regulations, they will neglect the real agencies which can alone bestow them; exercise, the one agent which gives, which can give, these qualities, both from its own nature and from the influence which it exerts upon all other agents of health, is, in a measure, neglected, nay, avoided, and to the imaginary virtues of diet men look for the longed-for acquisitions; they have yet to learn, they have yet to know, and to themselves realise, that power of muscle in trunk and limb, that freedom and capacity of heart and lung, that energy, stamina, strength and endurance, are not to be obtained from what they *eat*, but from what they *do*."

To each of these subjects, Exercise and Diet, a separate chapter is devoted; and each is treated in a masterly and exhaustive manner. Our space will not, however, permit of more than an allusion to them. Mr. Maclaren deprecates the error of confining the attention to any one form of exercise, on the ground that it must be insufficient to produce the desired result, that is to say, the increased action, and thereby the fuller development, of all the muscles of the body. He illustrates his meaning by the example of the man who, having one favourite author or favourite object of study, fails to cultivate or employ his *whole* mind. On the subject of Diet he is much less stringent and exclusive than is customary, and we think rightly so, recognising the fact that each one must be a law to himself; whence the truth of the trite saying, "What is one man's meat is another man's poison." His views on this point may be summed up in his own words: "I would only advocate the rational system of not suddenly breaking in upon a man's fixed habits, at the time you are asking for an effective display of his greatest bodily energies."

Another moot point, the question of the amount of sleep required by different persons under the same circumstances, is next discussed. No hard and fast rule is laid down, but the breadth of view that is one of the great charms of the book is again apparent. The opinion is expressed that the time to be devoted to the purpose should vary not only with the individual, but with the same individual at successive periods of life, and that the wants of the system, in this respect, are influenced by various causes, and by the action of the other agents of health, especially by exercise. With reference to this matter, we have frequently observed that tall persons require a longer period of recumbency than short, whose hearts are called upon for less powerful exertion, by reason of the smaller height of the column of blood that they have to sustain and propel.

The chapters next in order deal with the important but still subsidiary questions of air, bathing, and clothing. We cannot at present enter into detail with regard to any of these subjects, but we would add to Mr. Maclaren's observations on bathing, that one great secret of using a cold bath in the dressing-room without discomfort or injury, is to sit down in the water in the first instance, and to wash the upper part of the body, thus somewhat raising the temperature of the water before the feet are immersed.

The concluding portion of the book is devoted to very clear and practical directions for self-training for aquatic purposes, and in this, as in all other parts, it will be found a complete and trustworthy guide by those for whose use it is intended.

LETTERS TO THE EDITOR

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. No notice is taken of anonymous communications.*]

Herbert Spencer versus Thomson and Tait

A FRIEND has lent me a copy of a pamphlet recently published by Mr. Herbert Spencer, in which certain statements of mine are most unsparingly dealt with, especially in the way of attempted contrast with others made by Sir W. Thomson and myself. I am too busy at the present season to do more than request you to reprint one of the passages objected to (leaving it to your readers to divine to what possible objections it is open), and to illustrate by a brief record of my college days something closely akin to the mental attitude of the objector.

"Natural philosophy is an experimental, and not an intuitive science. No *d priori* reasoning can conduct us demonstratively to a single physical truth" (Tait, *Thermodynamics*, § 1).

One of my most intimate friends in Cambridge, who had been an ardent disciple of the late Sir W. Hamilton, Bart., and had adopted the preposterous notions about mathematics inculcated by that master, was consequently in great danger of being plucked. His college tutor took much interest in him, and for a long time gave him private instruction in elementary algebra in addition to the college lectures. After hard labour on the part of each, some success seemed to have been obtained, as my friend had at last for once been enabled to follow the steps of the solution of a question involving a simple equation. A flush of joy mantled his cheek, he felt his degree assured, and he warmly thanked his devoted instructor. Alas, this happy phase had but a brief duration; my friend's early mental bias too soon recovered its sway, and he cried in an agony of doubt and despair, "But what if x should turn out, after all, *not* to be the unknown quantity?"

Compare this with the following extract from Mr. Spencer's pamphlet:—

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